

**STATE OF HAWAII
PUBLIC UTILITIES COMMISSION**

**REPORT TO THE 2019 LEGISLATURE
ON
HAWAII'S ENERGY EFFICIENCY PORTFOLIO STANDARDS**

ISSUED PURSUANT TO SECTION 269-96
HAWAII REVISED STATUTES

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Executive Summary

In 2008, the State of Hawaii partnered with the United States Department of Energy to establish the Hawaii Clean Energy Initiative (“HCEI”), with a goal of meeting 70% of the State’s energy needs through renewable energy and energy efficiency by 2030. The Hawaii State Legislature subsequently passed Act 155, Session Laws of Hawaii 2009 (Act 155), codified under §269-96 Hawaii Revised Statutes (“HRS”), which established the State’s energy efficiency goals into an Energy Efficiency Portfolio Standard (“EEPS”). As specified in HRS §269-96, the statewide EEPS goal is 4,300 gigawatt-hours (“GWh”) of electricity savings by 2030.

This report is respectfully submitted by the Hawaii Public Utilities Commission in advance of the 2019 Legislative Session and addresses the First EEPS Performance Period (2009-2015), including more recent data where available. Pursuant to HRS §269-96, this report summarizes the Commission’s evaluation of the Energy Efficiency Portfolio Standard, including whether the EEPS remains effective and achievable.

Key findings

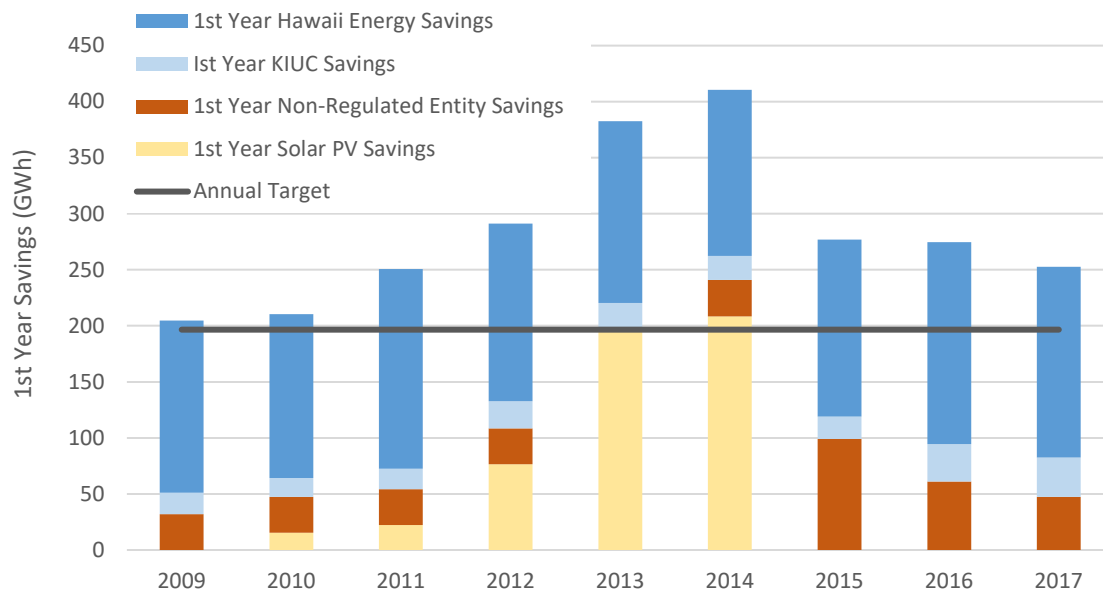
- 1. The EEPS goal has been effective at accelerating deployment of energy efficiency resources throughout the State.** During the First EEPS Performance Period (2009-2015), Hawaii achieved an estimated 2,030 GWh of electricity savings, exceeding the 2015 goal of 1,375 GWh of energy savings by nearly 50%. An additional 530 GWh of savings was achieved in 2016-2017. However, many of the most cost-effective energy efficiency opportunities have now been captured, which suggests that future investment will need to increase in order to continue to meet Hawaii’s ambitious energy efficiency goals.
- 2. Hawaii Energy, the State’s ratepayer-funded energy efficiency program administrator, is an essential component of the State’s efforts to capture cost-effective energy efficiency savings opportunities.** Hawaii Energy has delivered 1,106 GWh of energy savings, over 80% of the First EEPS Performance Period goal. Energy savings delivered by Hawaii Energy have reduced peak demand by 150 megawatts (“MW”) and will help customers save an estimated \$3.7 billion on their electricity bills over the life of the installed efficiency measures. Hawaii Energy has also provided a specialized focus on enabling low-income and other hard-to-reach customers to participate in the benefits of clean energy.
- 3. Energy efficiency remains a lower cost resource than most other energy options, while providing many other important benefits to Hawaii’s electric utilities and ratepayers.** However, Hawaii’s energy landscape has evolved significantly since the EEPS goal was established in 2009. Given the substantial increase in renewable energy available in Hawaii (such as solar PV and wind), it is no longer a given that energy efficiency will always displace fossil fuel generation. As customers continue to invest in low-cost renewable energy and increasingly, energy storage, energy efficiency programs and investments must be integrated with other clean energy initiatives. Going forward,

energy efficiency investments that provide time- and location-specific value to the grid are likely to be best-suited to offset traditional grid investments. As a result, a business as usual approach is not likely to be sufficient to achieve the 2030 EEPS goal. More aggressive and creative programming methods will be necessary to cost-effectively capture future energy efficiency savings. The Commission will consider whether changes to the EEPS Framework, including its goals and metrics, are needed to support efforts to increase future energy savings.

Interim EEPS goal exceeded

The EEPS goal has proven effective at accelerating deployment of energy efficiency resources throughout the State. In accordance with HRS §269-96, the Commission developed a framework (“EEPS Framework”) to govern the achievement of the EEPS goal, with four interim reporting periods, the first of which was completed in 2015.¹ As shown in Figure 1, the State exceeded the annual target in each year and exceeded the 2015 interim goal.² The State is also on track to meet the 2020 interim goal.³

Figure 1. Annual 1st Year Energy Efficiency Accomplishments, Statewide



Note: Pursuant to HRS §269-91, customer PV installations after 2014 count toward the renewable portfolio standard and no longer count towards the EEPS goal.

¹ The EEPS Framework was approved by the Commission in Decision and Order No. 30089, issued on January 3, 2012 in Docket No. 2010-0037.

² The First EEPS Performance Period (from 2009-2015) has an interim energy savings goal of 1,375 GWh, with annual targets of approximately 196 GWh.

³ Section 2 of this Report describes uncertainty in future savings estimates.

Hawaii Energy programs contribute majority of EEPS savings

Hawaii Energy is a ratepayer-funded energy efficiency program designed and implemented by the Public Benefits Fee Administrator (“PBFA”) under contract to the Commission, serving the islands of Hawaii, Maui, Lanai, Molokai, and Oahu.⁴ As illustrated in Figure 1, the incentives and services delivered by the Hawaii Energy program have provided just over half of total energy efficiency savings during the First EEPS Performance Period (a cumulative 1,106 GWh of 1st year savings). These savings represent 80% of the interim goal for the First EEPS Performance Period and were delivered at a cost far below the avoided cost of electricity generation. These impacts are expected to generate over three billion dollars of utility bill savings for customers over the life of the installed efficiency measures.

Energy efficiency provides additional benefits

Hawaii’s energy efficiency programs are critical to bringing the benefits of the clean energy transformation to those customers who cannot otherwise participate. Hawaii Energy has successfully innovated its program strategies to provide more savings and opportunities to low-income ratepayers, renters, small businesses and other “hard-to-reach” customers, using targeted incentive programs and transformational programs, which provide access to energy efficiency resources for all demographics, especially hard-to-reach communities.

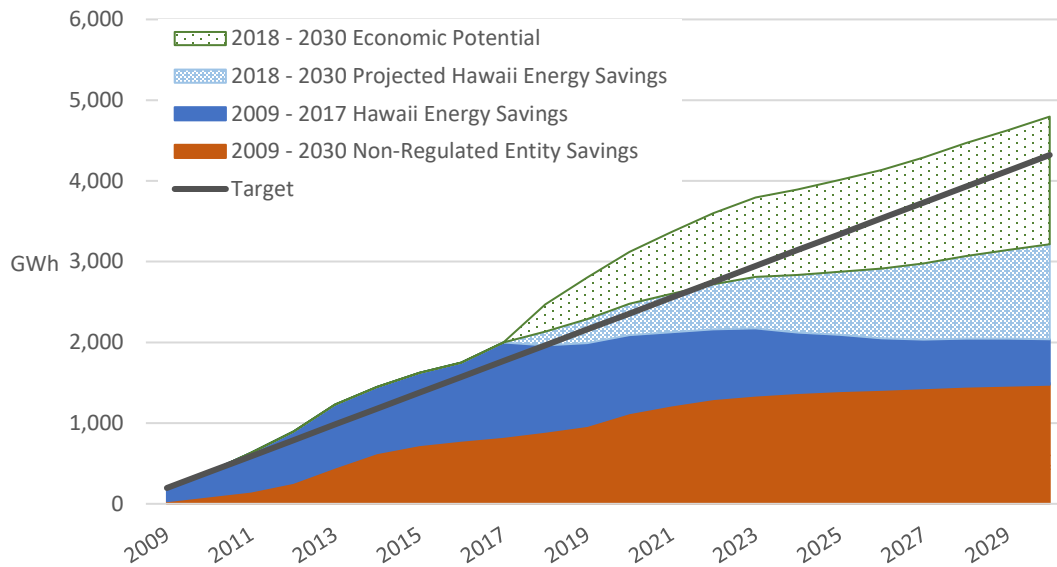
Energy efficiency provides many other important benefits to Hawaii’s utilities and ratepayers, including reduction in grid utilization (which reduces future utility capital and maintenance expenses for transmission and distribution assets), peak demand reduction (reduces requirements for generating capacity to serve peak load), reductions in the cost of compliance with environmental regulations, and reductions in overall electricity sales that contribute to meeting the State’s Renewable Portfolio Standards (“RPS”). In addition, by targeting energy efficiency investments based on time- and locational value to the grid, energy efficiency can improve the ability to integrate variable renewable resources into the existing power system.

Business as usual approach to EEPS may not be sufficient to achieve the 2030 EEPS goal

The preliminary forecast, using business as usual assumptions, shows that energy efficiency programs and activities are on track to meet interim goals through 2020, but may fall short between 2020 and 2030. The Commission has initiated an update of the 2014 Energy Efficiency Potential Study to aid the Commission and other stakeholders in evaluating the long-term achievability of the EEPS goal. Phase I of the 2019 Energy Efficiency Potential Study analysis indicates that the available, untapped, economic energy efficiency resource in Hawaii exceeds the EEPS goal of a cumulative 4,300 GWh in 2030. These preliminary findings, shown below, suggest that the EEPS goal is achievable, but requires strategic adaptation, possible increases in energy efficiency program budgets, and continued innovation in program design.

⁴ Kauai Island Utility Cooperative (“KIUC”) implements its own energy efficiency programs for its customers.

Figure 2. Energy Efficiency Potential, Statewide



More aggressive approach to Hawaii Energy required to maintain future savings levels

Hawaii Energy has cost-effectively contributed the majority of the EEPS savings to date. Maintaining the past level of savings is, however, becoming more difficult. For example, Hawaii Energy’s successful residential lighting program dominated the portfolio’s savings during the First EEPS Performance Period; that will not continue. Going forward, building codes and appliance standards will capture most of the residential lighting market savings that count toward EEPS goal achievement, requiring Hawaii Energy to shift focus to other, more expensive efficiency measures. As reflected in its 2018 Annual Plan, Hawaii Energy is already anticipating higher combined costs for energy efficiency savings than in prior program years. Without more funding, Hawaii Energy would need to shift more spending to the lower cost commercial programs in order to maintain total savings levels. These trends will drive up funding requirements for Hawaii Energy simply to maintain past savings levels. Thus, a business-as-usual funding and programmatic approach to the Hawaii Energy portfolio may not sustain that dominant level of contributions to the EEPS goals between 2020 and 2030.

Assessment of the EEPS Framework is underway

A decade into the 22-year EEPS implementation period, the clean energy revolution is well underway in Hawaii. At the time the EEPS Framework was established, utility grid needs and energy efficiency program best practices were generally well-understood. The Legislature, however, foresaw the possibility of increasing energy system complexity and encouraged the Commission to reevaluate the EEPS goal and metrics over time. The changing energy industry and Hawaii policy context may not be sufficiently addressed by the current EEPS Framework and metrics. For example, the increasing saturation of customer rooftop solar, emergence of lower-cost energy storage, demand response, and other variable energy resources require that

Hawaii address the time-varying value of efficiency. While the EEPS Framework provides broad policy guidance, it does not currently incorporate time-varying or locational value into the EEPS goals and metrics. Furthermore, meeting the current 2030 EEPS goal may, in fact, depend on adapting the EEPS Framework, including its metrics, to support greater penetration of renewable energy resources and serve broader policy objectives, such as clean transportation, carbon neutrality, and energy system resilience.

The work required to reevaluate the EEPS and Hawaii Energy programs is in progress. The PBFA together with the Commission and key stakeholders is now developing the Hawaii Energy program design for program years 2019 through 2021 with this changing context in mind. While general energy efficiency programs and services will remain the core component, new program elements that consider grid value enhancements, such as “demand response-ready” measures, consideration of the timing of efficiency savings, and serving all customer segments, are being addressed in the program planning process. This planning will continue into 2019.

As a part of the larger EEPS Review process, ongoing Hawaii-specific research activities (including the Baseline and Energy Efficiency Potential Studies) will inform stakeholder discussion regarding how and to what degree the EEPS Framework should evolve to more broadly support the energy and environmental policy objectives of the State. The Commission will continue stakeholder discussions with the EEPS Technical Working Group throughout 2019 to review ongoing EEPS research and to consider the following:

- Whether the Commission should adjust the overall EEPS goal (currently 4,300 GWh by 2030).
- Whether the Commission should adjust the amount of ratepayer funds that are collected and how they are allocated to fund energy efficiency programs.
- How the design and implementation of Hawaii Energy’s programs and services should be modified based on the results of the updated Baseline and Energy Efficiency Potential Studies.
- Whether the Commission should adjust the EEPS metrics and other aspects of the EEPS Framework to address increasingly critical issues of time-varying and locational value of energy efficiency.

I. Hawaii's Energy Efficiency Portfolio Standard

Energy efficiency is a means of using less energy to provide the same (or greater) level of energy services. Hawaii's EEPS is a statutory requirement to achieve an aggressive, long-term energy efficiency goal. Hawaii's EEPS law is similar in concept to Hawaii's RPS, which requires electric utilities to acquire increasing levels of energy from renewable resources by specified deadlines.⁵ Where the RPS goals are focused on the supply or generation of electricity, the EEPS goals are focused on reductions in the demand, or consumption, of electricity.

Act 155

In January 2008, the State and the United States Department of Energy established a long-term partnership with the purpose of transforming the way in which renewable energy and energy efficiency resources are planned and developed in the State. This partnership, referred to as the Hawaii Clean Energy Initiative ("HCEI"), set a goal for the State to meet 70% of its energy needs by 2030 through clean energy, with 30% coming from energy efficiency measures, and 40% coming from renewable sources.

Subsequently, the Legislature enacted Act 155, codified as HRS §269-96, which provides:

- a) The Commission shall establish energy-efficiency portfolio standards that will maximize cost-effective energy efficiency programs and technologies.
- b) The energy efficiency portfolio standards shall be designed to achieve 4,300 GWh of electricity use reductions statewide by 2030; provided that the Commission shall establish interim goals for electricity use reduction to be achieved by 2015, 2020, and 2025 and may also adjust the 2030 standard by rule or order to maximize cost-effective energy-efficiency programs and technologies.
- c) The Commission may establish incentives and penalties based on performance in achieving the energy efficiency portfolio standards by rule or order.
- d) The Commission shall evaluate the energy efficiency portfolio standard every five years, beginning in 2013, and may revise the standard, based on the best information available at the time, to determine if the energy efficiency portfolio standard established by this section remains effective and achievable. The Commission shall report its findings and revisions to the energy-efficiency portfolio standard, based on its own studies and other information, to the Legislature no later than twenty days before the convening of the regular session of 2014, and every five years thereafter.
- e) Beginning in 2015, electric energy savings brought about by the use of renewable displacement or off-set technologies, including solar water heating and seawater air conditioning district cooling systems, shall count toward this standard.

⁵ Hawaii's RPS (codified as HRS § 269-92) establishes percentages of renewable energy that must comprise net electricity sales: 30% of net electricity sales by December 31, 2020; 40% of net electricity sales by December 31, 2030; 70% of net electricity sales by December 31, 2040; and 100% of net electricity sales by December 31, 2045.

Development of the EEPS Framework

Pursuant to HRS §269-96, on March 8, 2010, the Commission opened Docket No. 2010-0037 to establish a stakeholder-based process to develop and implement a framework for achieving the State’s EEPS goal. The purpose of the EEPS Framework is to set forth broad principles and strategies for achieving the EEPS goal and to establish interim goals that will set the course for achieving the 2030 EEPS goal.

The parties to Docket No. 2010-0037 consisted of key stakeholders, including the PBFA, the electric utilities, government agencies, and industry and advocacy groups. After extensive stakeholder discussions, the Commission approved the EEPS Framework in Decision and Order No. 30089 on January 3, 2012.

The Commission acknowledged the inherent challenges of developing interim goals for a relatively new program with a statutory goal set for 2030. One important consideration is the need for adequate data and analysis of statewide energy efficiency potential on which to base interim goals and for allocating responsibilities for achievement. Another important challenge relates to the “jurisdictional gap,” which describes the fact that the Commission has jurisdiction over some entities that are expected to contribute to achievement of the EEPS goal (e.g., the electric utilities and the PBFA), but the Commission has no jurisdiction over many other critical contributors (“contributing entities”), including federal, state, and county government agencies, non-profit organizations, and other large electricity consumers.

The EEPS Framework addresses these and other challenges by providing broad guidance on responsibilities and roles for various entities that can contribute to meet EEPS goals. It also set interim goals broken out in five-year increments corresponding to the reporting periods prescribed in HRS §269-96. The Framework includes guidelines on measurement and evaluation of applicable EEPS savings. The Commission acknowledged that while the Framework is intentionally broad and flexible, it is based on the information and resources available during its development (2010-2011). It is expected that regular evaluation of the EEPS Framework and the EEPS goals will continue and may result in modifications or adjustments over time.

Public Benefits Fee Energy Efficiency Portfolio

Hawaii Energy is the branded name of the ratepayer-funded energy efficiency portfolio administered by the PBFA under contract with the Commission. Established in 2009 prior to the EEPS Framework, Hawaii Energy serves electric utility customers on the islands of Hawaii, Maui, Molokai, Lanai, and Oahu, (KIUC currently administers its own energy efficiency program for its customers.) Hawaii Energy’s programs and services are funded by a PBF surcharge collected

through customer bills.⁶ Energy savings reported through these programs developed by the PBFA are subject to verification by an independent auditor.⁷

Leidos Inc., serves as the current PBFA. The company is under contract until December 31, 2019 with the Commission to design and implement the Hawaii Energy program with an option to extend up to six additional years. Under the PBFA contract, a minimum of 70% of the PBFA budget is designated for direct incentives in the form of cash rebates or services for customers. Total administration costs including those for evaluation, measurement, and verification (“EM&V”), the PBFA Contract Manager, the Fiscal Agent, and the program finance auditor are limited to 10% of the overall budget.

When the EEPS program was established, the Hawaii Energy program was expected to be a primary contributor to the EEPS goal with codes and standards, other contributing entities, and market effects also materially contributing.

⁶ See HRS §§ 269-121 – 269-124 and Decision and Order No. 23258, Docket No. 05-0069, filed on February 13, 2007.

⁷ See HRS § 269-124(7).

II. Estimates of 2009 –2015 Statewide Energy Efficiency Savings

Pursuant to HRS §269-96, the Commission has evaluated progress towards meeting the statewide EEPS goal of a cumulative 4,300 GWh of savings by 2030. EEPS savings are measured beginning in 2009, the first performance year, through the final performance year, 2015, of the First EEPS Performance Period.⁸ The total performance goal for this seven-year reporting period is a cumulative savings of 1,375 GWh. This report also includes performance for 2016 and 2017 to provide the most current data where available.

Tables and figures in this report show three primary metrics describing energy savings of Hawaii Energy's portfolio and the EEPS program:

- 1st year savings: the aggregate energy savings from an energy efficiency measure, program, or portfolio achieved during the 12 months subsequent to implementation.
- Cumulative savings: a summation of 1st year energy savings achieved over two or more program years.
- Lifetime savings: the sum of annual energy savings delivered by a measure or program intervention over its measure life.

Statewide EEPS Savings

The 2030 EEPS goal was expected to be achieved by a combination of work by Hawaii Energy as well as other contributing entities, including:

- Kauai Island Utility Cooperative implements its own efficiency program for its customers. It is both a regulated entity and a contributing entity.⁹
- US Department of Defense is subject to federal Energy Independence and Security Act ("EISA") energy efficiency goals, which require a 30% energy use reduction by 2025.
- Hawaii State Government has a goal of 30% electricity use reduction by 2030.
- Codes and standards savings are attributable to federal and state appliance standards and building codes.
- Customer-Sited Solar Photovoltaic ("PV") systems provided 1st year savings prior to 2015 for PV systems installed before 2015. These savings are estimated based on Hawaiian Electric Companies ("HECO") data.¹⁰

⁸ The first reporting period thus includes two additional years compared to other periods outlined in the EEPS Framework.

⁹ For KIUC, estimated savings reflect the guidelines established by HRS §269-91 definition of "Renewable electrical energy," and energy efficiency technologies. These savings include heat pump water heating, ice storage, ratepayer-funded energy efficiency programs, and use of rejected heat from co-generation and combined heat and power systems. Fossil-fueled qualifying facilities that sell electricity to electric utility companies and central station power projects are not included.

¹⁰ Success of the net energy metering program for customer PV installations was seen in 2013 and 2014, where first year impacts from PV installations well exceeded Hawaii Energy portfolio 1st year impacts. Per HRS §269-91: "...beginning January 1, 2015, electrical energy savings shall not include customer-sited, grid-connected renewable-

Collectively, other contributing entities in the State play an important role in the statewide achievement of EEPS. While the US Department of Defense and State Government agencies are not subject to oversight by the Commission,¹¹ Hawaii Energy has been actively coordinating with most non-regulated contributing entities. As a result, most of the savings from other contributing entities – with the exception of contributions from KIUC, solar PV installed before 2015, and codes and standards – are captured through the Hawaii Energy program and therefore are not reported separately in the table and figure below to avoid double counting.¹²

During the nine years since the EEPS requirements were established, Hawaii consistently exceeded the EEPS interim annual savings goals in terms of 1st year savings. Hawaii Energy accounted for 80% of the EEPS interim goal and just over half of total EEPS Program 1st year savings contributions during the First EEPS Performance Period. The Commission has high confidence that Hawaii Energy will continue to provide the bulk of the energy savings in the Second EEPS Performance Period (2016-2020). However, it was never expected that the EEPS goal would be met by contributions from Hawaii Energy alone. Building codes and appliance standards are expected to provide an increasingly significant contribution toward EEPS savings. Hawaii also has opportunities to further increase these savings through local codes and appliance standards development and adoption. Coordination with other non-regulated entities will continue to be important for maximizing contributions toward EEPS goals.

energy systems.” After 2014, customer PV installations no longer count towards the EEPS goal, so PV values drop to zero on a 1st year savings basis but do provide ongoing savings that can be counted toward achievement of the EEPS goal.

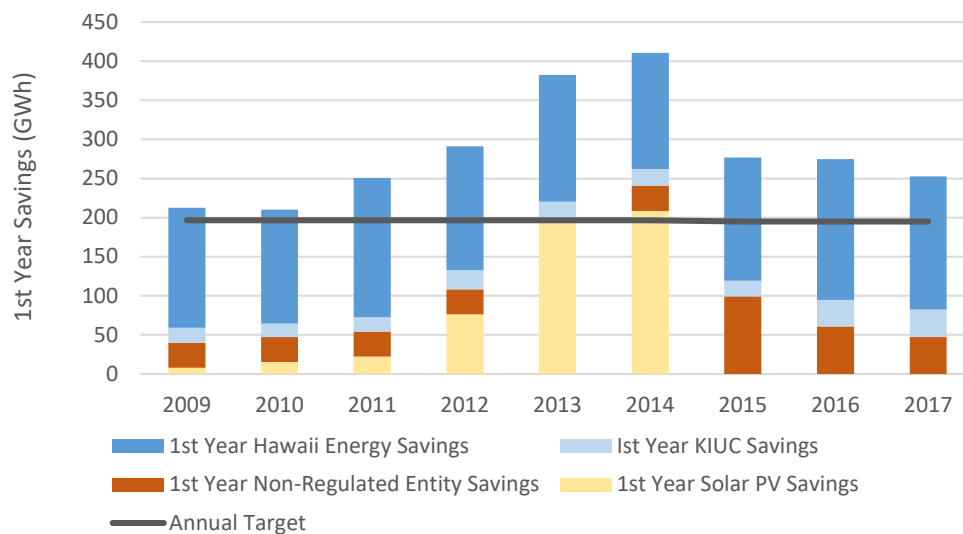
¹¹ In recognition of this reporting challenge, the EEPS Framework included consideration of explicit energy efficiency goals for all entities contributing to achievement of EEPS, including measurement and reporting of energy savings to the Commission. However, at this time, based on consultation with the TWG, the Commission has not established specific goals and reporting requirements for non-regulated entities contributing to the EEPS goal.

¹² Table 1 and accompanying Figure 3 present 1st year savings for the First EEPS Reporting Period plus 2016 and 2017. Hawaii Energy savings have been verified by a third-party evaluator. Building codes and appliance standards (which account for most of the “non-regulated entity” savings) estimates are based on current building practices and historical energy consumption but have not been independently verified. As with other potential studies, the forecasted savings in this analysis are based on previously adopted codes and standards and are conservative given the 40-year history of increasingly rigorous building code and appliance standard adoptions.

Table 1. Statewide 1st Year Savings, GWh ^{13,14}

| Program Year | System Level Hawaii Energy Savings | KIUC Savings ¹⁵ | Non-Regulated Entity Savings | Solar PV Savings prior to 2015 ¹⁶ | Total 1 st Year Savings |
|-----------------|------------------------------------|----------------------------|------------------------------|--|------------------------------------|
| 2009 | 153.8 | 19.2 | 31.9 | 7.9 | 212.8 |
| 2010 | 146.6 | 16.9 | 31.9 | 15.6 | 211.0 |
| 2011 | 178.3 | 18.3 | 31.9 | 22.3 | 250.8 |
| 2012 | 158.5 | 24.4 | 31.9 | 76.5 | 291.3 |
| 2013 | 162.2 | 22.4 | 3.4 | 194.7 | 382.7 |
| 2014 | 148.4 | 21.4 | 32.7 | 208.4 | 410.9 |
| 2015 | 157.8 | 20.0 | 100.1 | 0 | 277.9 |
| Subtotal | 1,105.6 | 142.5 | 264.3 | 525.4 | 2,037.8 |
| 2016 | 180.1 | 33.6 | 61.9 | 0 | 275.6 |
| 2017 Reported | 170.2 | 35.0 | 48.3 | 0 | 253.5 |
| Total | 1,456 | 211 | 375 | 525 | 2,567 |

Figure 3. Statewide 1st Year Savings Compared to Annual EEPS Goals



¹³ Program years (July through June) do not align with the annual goals on a calendar basis (January through December). Because program years and goals cover 12 months and annual goals are straight line goals, the comparison is appropriate. Hawaii Energy contributions are verified, but not measured, by a third-party evaluator; other contributing entity data is less certain.

¹⁴ Energy efficiency savings achieved by KIUC and the non-regulated contributing entities were identified through interviews with representatives at each entity.

¹⁵ KIUC's annual RPS report: <https://puc.hawaii.gov/wp-content/uploads/2018/04/RPS-KIUC-2017.pdf>

¹⁶ For 2009, solar PV savings estimates are from HECO's Net Energy Metering Status Report to the PUC. For 2010–2014, solar PV savings are from HECO customer account level data; cumulative installed kW capacity was multiplied by monthly capacity factors and adjusted to reflect annual degradation of PV production.

Performance of Hawaii Energy

Hawaii Energy contributed a majority of the EEPS energy efficiency savings to date. The program improved cost-effectiveness in recent years, delivering energy savings at a fraction of the utility's cost of electricity generation.

Hawaii Energy portfolio continues to deliver majority of EEPS interim goals

The Hawaii Energy program portfolio was successful in delivering substantial energy savings during the First EEPS Performance Period and is expected to contribute the bulk of energy savings during the Second EEPS Performance Period. Table 2 shows Hawaii Energy's accomplishments by program year over the First EEPS Performance Period and 2016 and 2017.¹⁷ For purposes of EEPS reporting, savings are presented at the system level. Over the nine-year operations of Hawaii Energy, the average annual 1st year savings achieved was 162 GWh resulting in a cumulative 1,456 GWh of 1st year savings achieved by 2017. Those achievements will deliver an estimated total lifetime energy savings of almost 11,650 GWh. Hawaii Energy program activities from 2009-2016 reduced also 150 MW of on-peak demand.

Table 2. Summary of Hawaii Energy System-Level Savings by Program Year

| Program Year | Demand Reduction (MW) | 1 st Year Savings (GWh) | Lifetime Savings (GWh) |
|-----------------|-----------------------|------------------------------------|------------------------|
| 2009 | 31.1 | 153.8 | 979.5 |
| 2010 | 23.3 | 146.6 | 1,039.0 |
| 2011 | 23.6 | 178.3 | 1,092.7 |
| 2012 | 20.7 | 158.5 | 1,109.1 |
| 2013 | 23.9 | 162.2 | 1,361.8 |
| 2014 | 26.2 | 148.4 | 1,174.7 |
| 2015 | 28.0 | 157.8 | 1,371.6 |
| 2016 | 25.7 | 180.1 | 1,713.5 |
| 2017 (reported) | 25.0 | 170.2 | 1,806.6 |

Table 3 presents Hawaii Energy's 1st year contributions relative to the EEPS goals through 2017. On the basis of 1st year savings, Hawaii Energy has been the largest contributor to the EEPS annual goals amounting to 82% of the cumulative annual EEPS Goals since the EEPS program began in 2009 and 57% of total EEPS achievements.

¹⁷ Hawaii Energy savings are calculated using a rolling baseline which accounts for the installation of equipment and measures which were likely to have occurred absent the program in a given year. These estimates are conservative when compared to an estimate using a 2008 baseline as suggested by the EEPS Framework.

Table 3. Hawaii Energy Savings as a Percent of EEPS Interim Goal¹⁸

| Year | Annual Goal | 1 st Year Savings as a % of Annual Goal | Cumulative Goal | Cumulative Savings as a % of Cumulative Goal |
|------|-------------|--|-----------------|--|
| 2009 | 196.5 | 78% | 196.5 | 78% |
| 2010 | 196.5 | 75% | 393.0 | 76% |
| 2011 | 196.4 | 91% | 589.4 | 81% |
| 2012 | 196.4 | 81% | 785.8 | 81% |
| 2013 | 196.4 | 82% | 982.2 | 81% |
| 2014 | 196.4 | 76% | 1,178.6 | 80% |
| 2015 | 196.4 | 80% | 1,375.0 | 80% |
| 2016 | 195.0 | 92% | 1,570.0 | 82% |
| 2017 | 195.0 | 87% | 1,765.0 | 82% |

Shifting measure and sector contributions to portfolio savings

Over the last nine years, the Hawaii Energy Portfolio has adjusted incentives for energy efficiency measures and overall program strategies. The lighting sector has been a key driver of savings during the First and Second EEPS Performance Periods. Over time, as Hawaii Energy successfully contributed to the transformation of the residential lighting market, the overall portfolio savings shifted from the residential sector to the business sector.

Figure 4 below shows total 1st year system-level savings by year. In 2009, the residential sector accounted for 59% of the savings. This sector continued to achieve the majority of savings until 2015. In the last two years, however, the commercial sector accounted for almost 60% of savings.

Figure 5 details that the shift from residential to commercial savings noted above is largely a function of lighting savings. Lighting savings in the commercial sector increased substantially in program years 2015 through 2017 through a focus on midstream and upstream programs, energy efficiency incentives, and targeted programs for small businesses. Meanwhile, Hawaii Energy programs provided a substantial contribution to the transformation of the residential lighting market. This success together with federal lighting standards, such as the anticipated 2020 Federal default standard, limit future residential lighting opportunities for Hawaii Energy. As a result, the residential lighting savings from programs have been decreasing over time. From the broader EEPS perspective, however, these savings continue to be counted in the codes and standards category.

¹⁸ Program years do not align with the annual goals on a calendar basis because program years run from July through June, while calendar years run from January through December. The comparison is appropriate because the annual goals are straight line goals both the program year and the annual goals cover 12 months. In 2030, an additional true-up will be required to capture savings that occurred in the last half of calendar year 2030 but would not have been included in PY2029 savings.

Figure 4. Contribution to 1st Year System Savings by Sector¹⁹

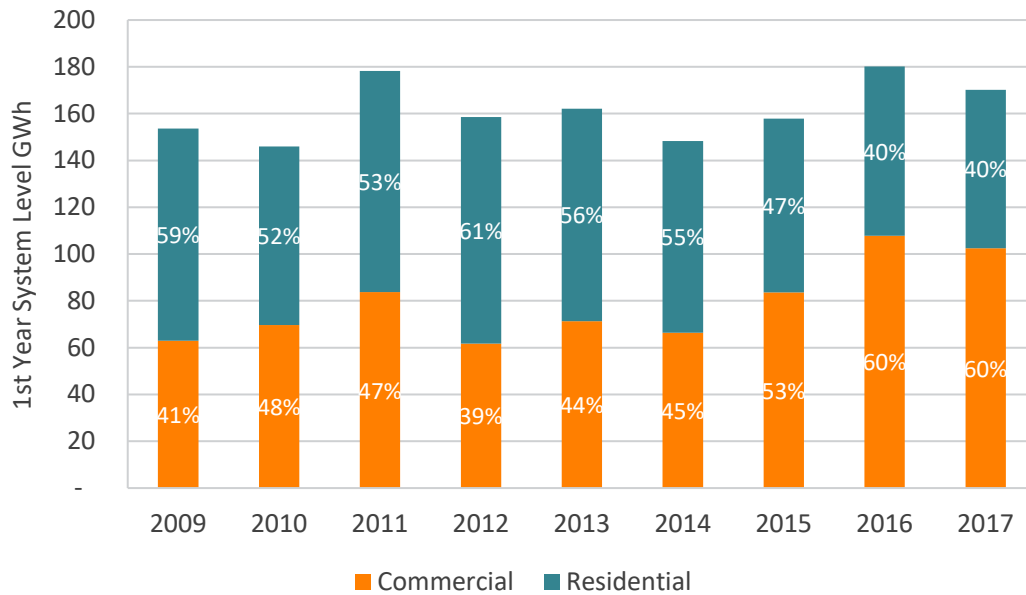
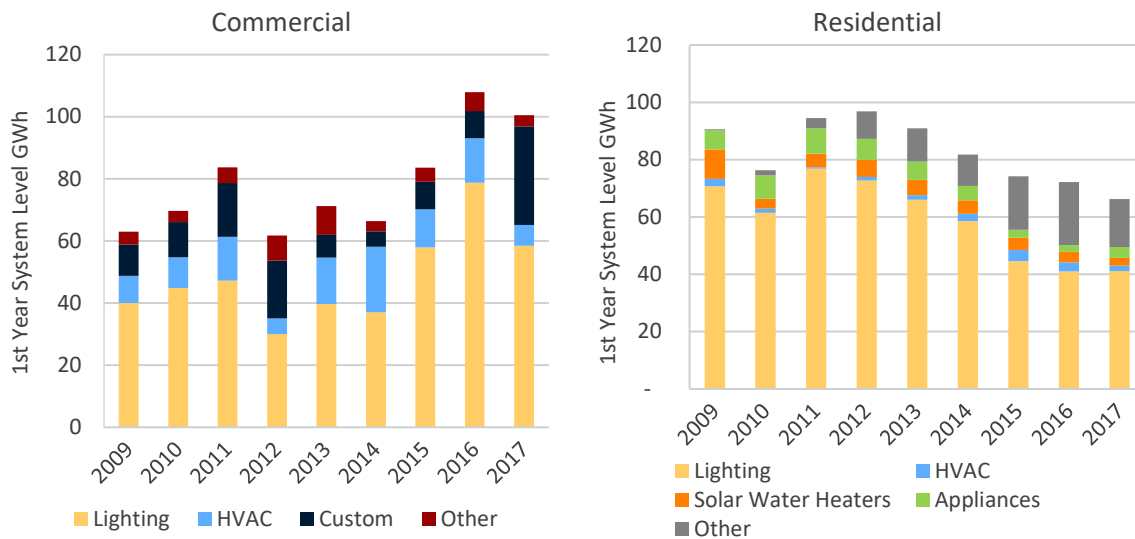


Figure 5. Sector Level Contribution to 1st Year System Savings by End Use²⁰



Note: Commercial “Other” is a mix of various measures that do not fit in one of the main categories such as variable frequency drives, premium efficiency motors, and high efficiency water heaters. Residential “Other” is primarily driven by Peer Group Comparison Reports program.

¹⁹ Energy savings are verified, system-level savings for 2009-2016 and reported system-level savings for 2017.

²⁰ GWh savings represent verified system level savings, except in 2017 which are “tracked” or claimed system level savings.

Cost and cost effectiveness trends of the Hawaii Energy portfolio

Despite the challenge of launching a new, comprehensive third-party energy efficiency portfolio in the unique Hawaii market, the Hawaii Energy program has been very cost effective from the start. In 2018, Hawaii ranked 16th in the American Council for an Energy Efficient Economy's most recent State Energy Efficiency Scorecard for its energy efficiency achievements.²¹ Despite the high cost of living in the State, Hawaii ranked much lower at 29th position in per capita spending on efficiency programs in 2017. The Scorecard leaders (e.g., Vermont, Massachusetts, California and Connecticut) are spending more than \$35 per capita annually whereas Hawaii spending amounted to only \$14.55 per capita in 2017.

In addition to exceeding national averages for energy efficiency program cost-effectiveness,²² Hawaii Energy program costs are a fraction of electricity prices in Hawaii. Hawaii Energy's direct program expenditures have maintained a lifetime energy savings cost effectiveness since 2013 of between 1.8 and 3.2 cents/kWh. Including costs borne by program participants, the lifetime cost of saved energy is estimated to be approximately 7-8 cents/kWh.²³ This cost is well below the "wholesale" cost of electricity in Hawaii, including recent power purchase agreements for utility-scale solar PV, and compares very favorably to average retail rates, which ranged from 26 to 33 cents/kWh during the same period.²⁴

Table 4 shows total annual Hawaii Energy lifetime cost of saved energy. In order to reduce bill impacts of the newly-created Green Energy Market Securitization ("GEMS") program, the PBF collections, which provide funding for Hawaii Energy, were reduced substantially beginning in program year 2016. Hawaii Energy adjusted its overall approach with "Hawaii Energy 2.0" including reduced incentive levels on a variety of energy efficiency measures, increased focus on lower-cost midstream and upstream program delivery, and implementation of other strategies to achieve more savings with less funding. The success of Hawaii Energy 2.0 strategies is apparent from the increased program impacts and reduced 1st year and lifetime cost of energy saved per kilowatt hour shown in Table 4.

²¹ <https://aceee.org/research-report/u1808>

²² Hoffman, Ian, et al. June 2018. *The Cost of Saving Electricity Through Energy Efficiency Programs Funded by Utility Customers: 2009–2015*. Lawrence Berkeley National Laboratory.

²³ These direct expenditures include incentives, program operations and management but exclude evaluation, outreach, transformational, supporting services, infrastructure, and facility fees and taxes. When including all portfolio costs, as well as customer-funded investments (participant costs) in efficiency associated with the Hawaii Energy programs, the LBNL study cited above (see note 22, *supra*) found the cost to be between \$0.07 and \$0.08 per kWh.

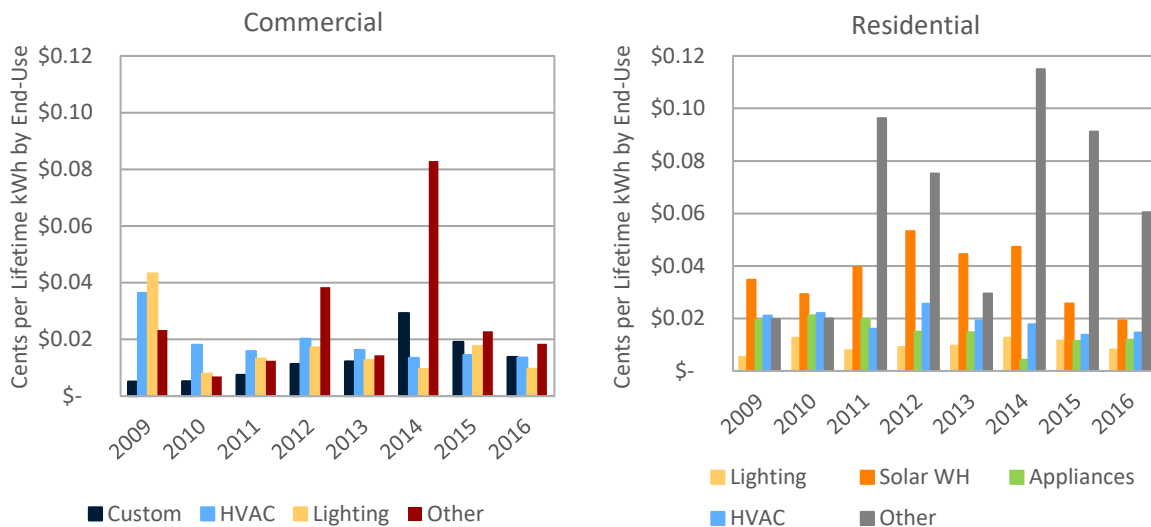
²⁴ https://files.hawaii.gov/dbedt/economic/data_reports/energy-trends/Monthly_Energy_Data.xlsx

Table 4. Summary of Hawaii Energy Expenditures and Costs

| Program Year | Total Program Administration and Expenditures (\$M) ²⁵ | 1 st Year Cost of Saved Energy (cents / kWh) | Lifetime Cost of Saved Energy (cents / kWh) | Lifetime Customer Bill Savings (\$M) |
|---------------------------|---|---|---|--------------------------------------|
| 2009 | \$18.2 | 11.8 | 1.5 | \$255 |
| 2010 | \$20.1 | 13.7 | 1.8 | \$473 |
| 2011 | \$27.3 | 15.3 | 2.5 | \$408 |
| 2012 | \$32.8 | 20.7 | 3.1 | \$405 |
| 2013 | \$32.0 | 19.7 | 1.8 | \$517 |
| 2014 | \$36.0 | 24.3 | 2.4 | \$436 |
| 2015 | \$36.9 | 23.4 | 2.2 | \$332 |
| Subtotal / Average | \$203.3 | 18.4 | 2.2 | \$2,826 |
| 2016 | \$29.5 | 16.4 | 1.3 | \$441 |
| 2017 | \$28.7 | 16.9 | 1.3 | \$488 |
| Total / Average | \$261.5 | 18.0 | 2.0 | \$3,755 |

Figure 6 provides additional detail on cost effectiveness trends by major end use category for each sector. Hawaii Energy has been able to drive down the cost of saved energy for most end uses since 2012. The cost-effectiveness of the residential “Other” category is driven by the short (one-year) measure life of the Peer Group Comparison Reports program.

Figure 6. Annual Cost Effectiveness by End Use and Sector



Between 2012 and 2015 residential programs were just 10-15% more expensive than commercial programs on a lifetime energy saved basis. In 2016 and 2017 the relative costs

²⁵ Total Program Administration and Expenditures includes all funds spent on Hawaii Energy. Lifetime Cost of Saved Energy reflects only direct program costs described in the previous paragraph.

appear to have diverged, with residential programs showing more than 30% higher cost per lifetime kWh saved. This divergence, if it continues, has implications for how program portfolios are re-balanced between residential and commercial programs. The Hawaii Energy program was able to innovate its way to lower combined programmatic costs per lifetime kWh saved between 2014 and 2017. The program year 2018 Annual Plan, however, anticipates a somewhat higher combined cost, supporting general industry expectations for increasing costs for energy efficiency savings in the future as lighting and other lower cost measures are retired from the Hawaii Energy portfolio due to new codes and standards and market transformation.

Hawaii Energy Programmatic Achievements

Hawaii Energy has successfully supported achievement of EEPS interim goals, leveraging \$262 M in program expenditures through program year 2017 to enable several billion dollars of customer bill savings over the life of the efficiency measures installed. In terms of programmatic and strategic achievements, successes over the first nine years of Hawaii Energy operations include:

- Supporting the successful transformation of the residential lighting market in Hawaii.
- Increasing services to hard-to-reach customer segments, including development and expansion of multifamily and small business direct install programs.
- Expanding transformational programs, including codes and standards, trade ally training, and engagement with non-profits to bring program benefits to hard-to-reach customers.
- Developing strategies to address time and location value of energy efficiency to better align energy efficiency programs with grid needs.

Hawaii Energy has contributed to the transformation of the residential lighting market

Hawaii Energy market interventions focusing on screw-base compact fluorescent lamps (“CFLs”) and light emitting diode lamps (“LEDs”) have significantly contributed to the transformation of the market for general service, medium screw-base lamps (the standard “A-lamp” light bulb category) in the residential sector. By the end of program year 2015, well above half of all residential sockets in Hawaii held high efficiency CFLs or LEDs, ahead of other jurisdictions with mature lighting programs.²⁶ The energy savings from these market share gains achieved first with CFLs and then LEDs are expected to be “locked in” by the federal EISA 2020 default standard for general services lamps.

The portfolio has increased service to lower income and hard-to-reach customers

Hawaii Energy’s “direct install” programs address some participation barriers for hard-to-reach customers by providing a simplified offering through direct installation of energy and water saving measures at no cost to the participating customer. Direct install programs provide customers with right-sized equipment for their businesses or homes, installed and commissioned by an energy industry professional. The Small Business Direct Install program began in 2011, has grown over time, and expanded to include contractor technical training and professional development. Hawaii Energy reported that it helped over 750 under-served small

²⁶ Opinion Dynamics Corporation. October 2017. *Hawaii Energy Comprehensive Longitudinal Effects Study*.

businesses with its direct install lighting program in 2017, providing estimated customer savings of over 123,083 Megawatt hours (“MWh”) and \$28,000,000 in utility bill savings during the life of the lighting system for these businesses.

In 2018, the Small Business Direct Install Program was renamed “Energy Advantage.” The Energy Advantage program also helped with rapid response to deliver energy efficiency when Hawaii Island lost renewable generation from the Puna Geothermal Venture power plant due to the eruption of the Kilauea volcano. Hawaii Energy provided Big Island businesses and residents with increased incentives, discounts, and rebates on energy efficiency measures to assist during a time when air quality was affected and use of air conditioners and purifiers escalated.

The Multifamily Direct Install program, now known as “Energy Smart 4 Homes,” was launched in 2014 as part of Hawaii Energy’s continued efforts to make simple energy-efficient products readily accessible to residential utility customers. This program successfully supported the retrofit of over 1,000 rental units owned by the City and County of Honolulu, a large portion of the State of Hawaii Public Housing Authority rental properties, and units managed by Catholic Charities. Direct install program integration in the community has facilitated new services to low income and hard-to-reach customers with such initiatives as Molokai’s “Hui Up!” refrigerator replacement drives and energy literacy workshops on Maui.

Expanded transformational program

Hawaii Energy’s portfolio of energy efficiency initiatives includes increased focus on transformational programs, including development of state-level codes and standards, trade ally training, and engagement with non-profits. Hawaii Energy has become a recognized leader and driver of energy efficiency in the State. Transformational programs provide access to energy efficiency resources for all demographics, especially in hard-to-reach communities including low-income, underserved, and vulnerable populations.

Hawaii Energy has reached many of the State’s customers through its various programs and outreach activities. The Peer Group Comparison Report program, for example, provides residential customers with periodic reports on comparative energy use and serves as a channel to offer customers other program services. Through these activities, Hawaii Energy built strong brand awareness.²⁷ Hawaii Energy continued to push the branding strategy further following a significant brand enhancement effort launched in 2017, including the new “Pluggly” mascot. This effort has increased customer awareness of Hawaii Energy’s programs and services.

Transformational activities were further expanded in 2018. Through outreach and program design strategies, such as shifting toward instant discounts from retailers and vendors rather than post-sale customer rebates, Hawaii Energy has leveraged trade ally partnerships to drive

²⁷ A brand awareness study conducted in 2017 by the PBF evaluation contractor noted: “Awareness of Hawaii Energy compares very favorably to other jurisdictions that offer and promote energy efficiency programs, especially considering the program’s lifespan to-date and the size of the budget dedicated to brand awareness.”

vibrant energy efficiency markets in Hawaii. In addition, Hawaii Energy's support for counties and code bodies to adopt the 2015 building code has continued with the goal of full county adoption of the new building code, which is expected to produce large, long term savings.

Moreover, the Hawaii Energy non-profit service program pilot will help three to five organizations execute energy efficiency projects and reduce operating costs. Hawaii Energy is also working with the Aloha United Way to identify and reduce the energy burden for hard-to-reach customers. These programs go beyond traditional incentive programs, offering specialized services to more effectively partner with community-based organizations and those they serve. With a robust brand identity and broad partnerships, Hawaii Energy is a visible, effective, customer-facing platform for implementing energy efficiency solutions for the EEPS program as well as future energy, grid support, and climate-related initiatives.

Integrated resources program demonstrations

Hawaii Energy has recently been scaling up its efforts to explore new portfolio directions in response to the increase in variable, renewable generation connected to the grid. In 2018, Hawaii Energy initiated new collaborative demonstration efforts strategically aligned with alternatives to traditional grid investments that integrate demand side management, renewable energy, and energy storage technologies.

Hawaii Energy has been meeting regularly with the utility demand response team to find ways to use Hawaii Energy's presence with HECO customers to support HECO's demand response initiatives. Working with this team, Hawaii Energy is co-funding a grid-interactive water heating project that will demonstrate how new technologies can increase the efficiency and reliability of the grid while serving the hard-to-reach renter population. Detailed water heating data collected from the pilot will guide the design of future programs. In 2018, Hawaii Energy launched a demonstration project with solar PV plus storage solution providers. This project helps future PV customers optimize their PV plus storage systems through energy efficiency and behavioral guidance. The project encourages operating appliances (such as dishwashers and dryers) during daytime hours when low-cost solar PV energy is available and exporting to the grid is less valuable to the utility. These initiatives, coupled with ongoing stakeholder collaboration, are intended to test innovative processes and programs that could be deployed in the next three-year program cycle.

III. Achieving the 2030 Energy Efficiency Portfolio Standard

This section describes the energy efficiency policy context for the ongoing review of EEPS, provides current estimates of the remaining energy efficiency potential in Hawaii, and summarizes the evolving portfolio strategies and energy savings potential going forward.

Policy Context for the EEPS Review

A decade into the 22-year EEPS implementation period, the clean energy revolution is well underway in Hawaii. A combination of policy directives, programs, and technological advancements are transforming the way electricity is produced and used in Hawaii. As a result, the value of energy efficiency to customers and the grid is increasingly linked to customer and utility-scale renewable energy, energy storage, and demand response. Energy efficiency can also support other important policy objectives whose importance has risen since the beginning of the First EEPS Performance Period, including promoting electric vehicles, carbon neutrality, and energy system resilience.

The Renewable Portfolio Standard and EEPS

When HCEI was established in 2008, electric prices in Hawaii were the highest in the nation and nearly all of the state's electricity was generated using imported fossil fuel. Variation in the value of energy efficiency by time of day, week, season, or location was not a significant consideration for energy efficiency portfolio design. That has changed. Today, Hawaii generates more than one-quarter of its electricity using local, renewable resources instead of imported fossil fuel. Tens of thousands of customers produce and consume energy using a wide range of distributed energy resources (e.g., solar PV, energy storage, and demand response) available, or becoming available, in Hawaii to provide essential grid services and help manage consumer energy costs. Given that the State is working to reach a goal of 100% renewables by 2045, it is critical to consider the implications of energy efficiency in a renewables-dominated grid.

Even with a high penetration of renewable generation resources, energy efficiency programs can provide multiple benefits:²⁸

- Efficiency continues to be a low-cost electricity resource that reduces utility bills for Hawaii's electricity customers.
- Efficiency enables low income and hard-to-reach customers to directly participate in the benefits of Hawaii's clean energy transition.
- Efficiency reduces demand and consumption, and thus reduces the total amount (and cost) of renewables that must be built to achieve a 100% renewable future.

²⁸ US Environmental Protection Agency. July 2018. [Quantifying the Multiple Benefits of Energy Efficiency and Renewable Energy: A Guide for State and Local Governments -- Part One: The Multiple Benefits of Energy Efficiency and Renewable Energy](#). Pages 8-9. Goldstein, David. May 2018. *Renewables may be plunging in price, but efficiency remains the cornerstone of the clean energy economy*. [The Electricity Journal](#), 31:4. Pages 16-19.

- Efficiency projects can be implemented quickly - typically within months rather than the years often required to develop, permit, build, and interconnect generation resources accelerating the schedule to meet RPS goals.
- Strategic efficiency investment supports more resilient and reliable electrical systems, reducing overloading on distribution system components that operate less efficiently and are more prone to failure when overheated.
- Effective efficiency can offset significant increases in electrical consumption associated with vehicle electrification.
- Efficiency investment provides additional benefits, including:
 - Increased direct employment from energy efficiency-related jobs, as well as indirect local employment resulting from increases to customers' disposable income.²⁹
 - Improved comfort, productivity and human health result, for example, from improved lighting, air conditioning, and ventilation performance from advanced, high efficiency systems.

To realize the full potential of energy efficiency in a renewables-dominated grid, programs must deliver savings when and where they are most valuable to the grid. Efficiency impacts may be more or less desirable at different times of day and in different locations. During a sunny afternoon, for example, there may already be more solar PV supply than needed to serve customer loads; energy efficiency may have a comparatively low value to the grid. As the proportion of renewable resources rises, the need to adjust for the moment to moment (e.g., due to passing clouds), daily, and seasonal variability of both supply and demand increases the importance of when and where energy efficiency manifests on the grid. The future Hawaii Energy portfolio can be managed to provide improved time-varying value and to complement and support increasing renewables penetration.

Hawaii Energy has energy efficiency portfolio suggestions to address the time-varying value of energy efficiency.³⁰ Additionally, the Hawaii Energy program delivery infrastructure can be leveraged to collaborate with other stakeholders and programs outside of traditional energy efficiency to support reliable, resilient, and cost-effective grid performance. For example, Hawaii Energy is currently collaborating with HECO to promote demand response programs which provide additional dynamic support to the grid.

A properly managed energy efficiency portfolio is an important policy, environmental, and energy resource for Hawaii in the context of the 100% RPS goal. Furthermore, as described in this report, meeting the current 2030 EEPS goal will depend on adapting energy efficiency programs to support greater penetration of renewables and serving broader policy objectives

²⁹ Bell, Casey. October 2012. "Energy Efficiency Job Creation: Real World Experiences." American Council for an Energy Efficient Economy. Page 1.

³⁰ As described in the "[Time-varying value of electric energy efficiency](#)" report, there is also work to periodically optimize the energy efficiency portfolio with best available information to assure that the energy efficiency value proposition and grid performance is maintained. (Mims, Natalie, Eckman, Tom and Charles Goldman. June 2017. Lawrence Berkeley National Laboratory Electricity Markets and Policy Group. Page vii.)

beyond the current EEPS goal. Suggested adaptations include innovative program strategies, accelerating energy efficiency investments, and increasing services to low-income and hard-to-reach communities.

While the current EEPS Framework focuses on reducing fossil fuel use and achieving a long-term efficiency target, the Framework anticipated changing conditions and encouraged the Commission to reevaluate the EEPS goals, targets, and metrics periodically to ensure the EEPS program serves ongoing State interests. The Commission's current review of the EEPS Framework and discussions with stakeholders over the next year may lead to changes - including revised and new EEPS metrics - that explicitly encourage energy efficiency programs to address time-varying and locational value to the grid.

Hard-to-reach programs

During stakeholder outreach conducted by Hawaii Energy in 2018, stakeholders have consistently identified a need to ensure that hard-to-reach, vulnerable, and less affluent portions of Hawaii's population are not left behind. This interest led to new programs during the First EEPS Performance Period, both inside and outside of the Hawaii Energy portfolio. The small commercial direct install program and multifamily direct install programs are examples of Hawaii Energy's efforts to more aggressively address what Aloha United Way defines as Asset Limited, Income Constrained, Employed ("ALICE") customers. Hawaii Energy has also expanded its focus on customer equity through various new transformational programs, outreach and education, and collaboration with community organizations. Serving hard-to-reach customers will continue to be a primary focus of program design and a critical component of EEPS initiatives. In the future, EEPS goals and metrics may be developed to support delivering more services to hard-to-reach customers.

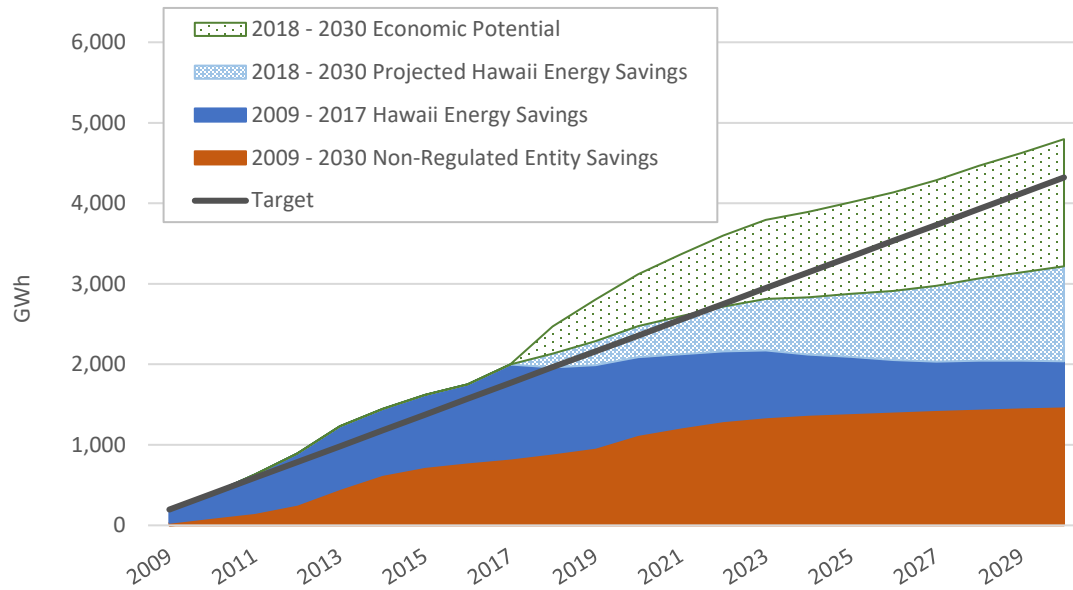
Energy Efficiency Potential Study Preliminary Findings

The current EEPS Review process includes a full update of the 2014 Energy Efficiency Potential Study. A partial update (Phase I) of the Potential Study was completed in November 2018 to inform this report and provide guidance for the second phase. The Phase I update used a simplified approach based on extrapolating data from the island of Oahu, and estimated historical savings from codes and standards that offers preliminary insights into the potential for future economic energy savings, including:

- Savings from codes and standards already on the books. In 2015 and 2020, these savings increase dramatically as a result of the lighting provisions of the Energy Information and Security Act ("EISA").
- Ongoing programs savings under the business as usual assumptions.
- "Economic potential", which refers to additional, cost-effective savings that are available for capture through programs or other interventions.

Figure 8 illustrates the preliminary findings that Hawaii continues to have economic potential savings in excess of the EEPS 2030 goal. As such, achieving the EEPS 2030 goal appears feasible.

Figure 8. Energy Efficiency Potential, Statewide



Near-term Program Planning

Work to reevaluate the Hawaii Energy programs is in progress. The PBFA together with the Commission and interested stakeholders is now developing the Hawaii Energy program design for program years 2019 through 2021 with the changing energy system context in mind. Two public stakeholder workshops were conducted by Hawaii Energy in 2018 to solicit input for innovative portfolio strategies. Many stakeholders expressed support for a more integrated approach for the Hawaii Energy portfolio. While conventional energy efficiency programs are expected to remain the core component for at least the next several years, new program elements that support a future of efficient, grid-integrated buildings³¹, “demand response-ready” measures, valuing the time and locational characteristics of efficiency savings, and serving all customer segments, are being addressed in the program planning process. Near-term program planning, which will continue into 2019, is organized around three key principles:

- Energy efficiency remains highly cost-effective and is often the lowest cost energy resource.
- Energy efficiency can extend the benefits of the clean energy transformation in Hawaii to customers who cannot otherwise participate.
- Energy efficiency programs can transform buildings into a smart, resilient, grid resource.

³¹ <https://www.energy.gov/eere/buildings/grid-interactive-efficient-buildings>

IV. Findings and Conclusions

Interim EEPS goal achieved

Hawaii achieved the 2015 interim EEPS goal and is on track to meet the 2020 interim EEPS goal. The EEPS goal established by the Legislature in 2009 has spurred the rapid scale-up of energy efficiency programs and corresponding energy savings. Estimates suggest that Hawaii exceeded the 2015 interim EEPS goal by approximately 655 GWh, or more than 47%, above the cumulative savings goal for the First EEPS Performance Period.

Hawaii Energy programs contribute majority of EEPS goals

Over the first seven years of the program, the incentives and services provided by Hawaii Energy have delivered 80% of the First EEPS Performance Period goal and 54% of total efficiency contributions to meet the EEPS, for a total of 1,106 GWh of 1st year savings, at a cost well below the cost of electricity generation. These impacts are expected to generate over three billion dollars of utility bill savings for customers over the life of the installed efficiency measures. Furthermore, Hawaii Energy program activities from 2009 through 2016 reduced on-peak demand by 150 MW.

Energy efficiency provides additional benefits

Hawaii Energy has increased its focus on program strategies and services specifically targeted to provide savings to low-income ratepayers, renters, small businesses, and other hard-to-reach customers in the form of incentive programs and transformational programs. Energy efficiency provides many other important benefits to Hawaii's utilities and customers, including reduction in utilization of the grid, job creation, productivity and health benefits, and reduced cost for meeting the State's RPS goal.

Preliminary findings from the 2019 Energy Efficiency Potential Study

The Commission has initiated an update of the 2014 Energy Efficiency Potential Study to aid the Commission and other stakeholders in evaluating the long-term achievability of the EEPS goal. Phase I of the 2019 Energy Efficiency Potential Study analysis indicates that the available, untapped, economic energy efficiency resource in Hawaii exceeds the EEPS goal of a cumulative 4,300 GWh in 2030. These preliminary findings suggest that the EEPS goal is achievable, but will require strategic adaptation, increased energy efficiency investments, and innovative approaches to program design.

More aggressive portfolio and policy strategies are likely needed to meet the 2030 EEPS goal

The preliminary forecast, using business as usual assumptions, shows that the EEPS program is on track to meet interim goals through 2020, but may fall short between 2020 and 2030. While Hawaii Energy programs have improved their cost-effectiveness in recent years, Hawaii Energy cost-effectiveness has reached an inflection point. The changing markets and the call on these programs to serve many objectives also puts pressure on Hawaii Energy's budget. For reasons described in this report, Hawaii Energy must begin shifting to more expensive efficiency measures in order to continue to deliver similar levels of savings in future years. Total portfolio

spending will likely need to increase if Hawaii Energy contributions toward EEPS goals are to be maintained from 2020 through 2030.

Commercial sector savings have been more cost-effective than residential savings. Without increased funding for Hawaii Energy for higher expected costs for residential programs, commercial programs will need to pick up anticipated shortfalls in the residential programs to maintain overall portfolio savings. Regardless, commercial sector resource acquisition program strategies will be increasingly critical for meeting the EEPS 2030 goal.

Higher residential program expenditures can allow Hawaii Energy to maintain proportional residential savings and serve hard-to-reach segments. The expected focus on serving ALICE customers and other hard-to-reach markets will increase the cost per kWh of savings, putting additional pressure on the overall budget for the Hawaii Energy portfolio. In addition, energy efficiency program planning must accommodate further integration with demand response programs and other policy goals. This has cost-effectiveness implications because such activities require funding but do not provide direct energy efficiency impacts as measured by current EEPS metrics. Metrics can be revisited to allow work toward both the EEPS numeric goals and other policy objectives, including serving hard-to-reach customers.

Capturing the intended benefits from EEPS is increasingly complex

The EEPS Framework contemplates that energy efficiency will provide more than energy savings and customer bill reductions. Energy efficiency provides other important benefits to Hawaii's utilities and ratepayers, including reduction in grid utilization (which can reduce future utility capital and maintenance investments in transmission and distribution assets), peak demand reduction (reduces requirements for generating capacity to serve peak load), reductions in the cost of compliance with environmental regulations, and reductions in overall electricity sales, which helps accelerate attainment of the State's RPS.

To fully realize the full potential of energy efficiency in a renewables-dominated grid, efficiency initiatives must deliver savings when and where they are valuable to the grid. The future Hawaii Energy portfolio, for example, can be managed to focus on time-varying value efficiency and explicitly treat customer buildings as a critical, resilient grid resources. The increasing saturation of customer rooftop solar, energy storage, and other variable energy resources on the grid underscores the need to revisit the EEPS goals and metrics.

Hawaii Energy, together with the Commission and key stakeholders, is developing program plans for the next three-year program cycle with this changing context in mind. While conventional energy efficiency programs will remain the core component, new program elements that consider grid needs such as "demand response-ready" measures, the timing and locational value of efficiency savings, and meeting the needs of hard-to-reach customers are being addressed in the program planning process.

Assessment of the EEPS Framework is underway

The EEPS Review process is underway, including development of a Baseline Study and an update to Energy Efficiency Potential Study. These studies will inform stakeholder discussion regarding how and to what degree the EEPS program should evolve to more broadly support the energy and environmental policy objectives of the State.

The Commission will continue stakeholder discussions with the EEPS Technical Working Group throughout 2019 to review ongoing EEPS research and to consider the following:

- Whether the Commission should adjust the overall EEPS goal.
- Whether the Commission should adjust the amount of ratepayer funds that are collected and how they are allocated to energy efficiency programs.
- How the design and implementation of Hawaii Energy's programs and services should be modified based on the results of the updated Baseline and Energy Efficiency Potential Studies.
- Whether the Commission should adjust the EEPS metrics and other aspects of the EEPS Framework to address increasingly critical issues of time-varying and locational value of energy efficiency.

After review of the First EEPS Performance Period and consideration of expected future energy efficiency opportunities, the Commission concludes the EEPS goal remains effective and achievable. Nevertheless, the Commission believes that energy efficiency program design must adapt to the evolving energy landscape to continue progress toward the EEPS goal and maintain and enhance the benefits that energy efficiency brings to the State.

The Commission will consider the input of the EEPS Technical Working Group on the issues identified above and may determine that adjustments to the guidelines and requirements of the EEPS Framework are warranted.

Pursuant to HRS § 269-96, the next report to the Legislature on the status of the State's Energy Efficiency Portfolio Standard will be submitted in advance of the 2024 Legislative Session.